

**THE DoD GATEWAY INFORMATION SYSTEM
DIRECTORY OF RESOURCES**

C. E. Jacobson and G. A. Cotter

**D
T
I
C** Defense
Technical
Information
Center

Office of Information Systems and Technology

Cameron Station, Alexandria, VA 22304-6145

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED/UNLIMITED			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
4. PERFORMING ORGANIZATION REPORT NUMBER(S) DTIC/TR-86/8			7a. NAME OF MONITORING ORGANIZATION		
6a. NAME OF PERFORMING ORGANIZATION Defense Technical Information Center		6b. OFFICE SYMBOL (if applicable) DTIC	7b. ADDRESS (City, State, and ZIP Code)		
6c. ADDRESS (City, State, and ZIP Code) Cameron Station Alexandria, VA 22304-6145		9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER			
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Defense Technical Information Center		8b. OFFICE SYMBOL (if applicable) DTIC	10. SOURCE OF FUNDING NUMBERS		
8c. ADDRESS (City, State, and ZIP Code) Cameron Station Alexandria, VA 22304-6145		PROGRAM ELEMENT NO. 65801S	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) The DoD Gateway Information System Directory of Resources					
12. PERSONAL AUTHOR(S) Jacobson, C.E. and Cotter, G.A.					
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM TO		14. DATE OF REPORT (Year, Month, Day) 8608	
15. PAGE COUNT 14					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	Online Directories, Database Management Systems, Gateways, Database Design, Requirements Analysis		
19 ABSTRACT (Continue on reverse if necessary and identify by block number)					
<p>The Defense Technical Information Center (DTIC) is sponsoring development of a DoD Gateway Information System (DGIS) to provide online, streamlined methods for identifying, accessing, searching and analyzing data from heterogeneous databases of interest to the DoD community. At the core of the gateway system is a Directory of Resources which contains information on the content, scope and availability of selected databases. Presently, the Directory references over 430 DoD-sponsored R&D databases, but this figure is expected to grow to over 3,000 when coverage is expanded to include additional DoD, other federal, and commercial databases. The prototype Directory runs on a VAX 11/780 minicomputer using the INGRES database management system and is available to a select community of users for test and evaluation. A critical feature is the menu-driven interface designed to assist end-users. This paper describes data collection, database design, implementation of the Directory and menu-driven interface, and future directions.</p>					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED/UNLIMITED		
22a. NAME OF RESPONSIBLE INDIVIDUAL G.A. COTTER			22b. TELEPHONE (Include Area Code) 202/274-5367		22c. OFFICE SYMBOL DTIC-EB

THE DOD GATEWAY INFORMATION SYSTEM DIRECTORY OF RESOURCES

Carol E. Jacobson and Gladys A. Cotter

The Defense Technical Information Center (DTIC) is sponsoring development of a DoD Gateway Information System (DGIS) to provide online, streamlined methods for identifying, accessing, searching and analyzing data from heterogeneous databases of interest to the DoD community. At the core of the gateway system is a Directory of Resources which contains information on the content, scope and availability of selected databases. Presently, the Directory references over 430 DoD-sponsored R&D databases, but this figure is expected to grow to over 3,000 when coverage is expanded to include additional DoD, other federal, and commercial databases. The prototype Directory runs on a VAX 11/780 minicomputer using the INGRES database management system and is available to a select community of users for test and evaluation. A critical feature is the menu-driven interface designed to assist end-users. This paper describes data collection, database design, implementation of the Directory and menu-driven interface, and future directions.

Online Directories, Database Management Systems, Gateways,
Database Design, Requirements Analysis

1. INTRODUCTION

The Department of Defense (DoD) Research and Engineering community requires rapid, easy access to scientific and technical information (STI) relevant to its mission. This information is contained in a multiplicity of databases maintained within the federal and commercial sectors. The Defense Technical Information Center (DTIC) has as its mission the acquisition, storage, retrieval, and dissemination of STI to support the management and conduct of DoD research, development, engineering, and studies programs. Therefore, DTIC is developing the DoD Gateway Information System (DGIS) to provide this community with a modern tool for identifying, accessing, and interrogating these databases (Ref. 1).

A primary component of DGIS is the Directory of Resources, a database of databases. The Directory contains information on the content and scope of databases relevant to DoD. It is subject-searchable so that upon entering the topic of interest the user is provided with a list of appropriate databases. This paper describes data collection, database design, implementation of the Directory, and future directions.

2. DATA COLLECTION

Databases of interest to the DoD community are found within the academic and commercial sectors, as well as the federal sector. There are many directories and vendor services available that aid in the identification of commercial and prominent federal databases relevant to DoD. Based on descriptions provided by these sources and, in some cases, follow-up telephone calls to database producers, databases were selected for inclusion in the Directory.

Unfortunately, identification tools were not readily available for many of the small, specialized DoD databases. To fill this void, a questionnaire was developed and distributed to over 1200 of DTIC's DoD users. Over 430 research and development (R&D) databases were identified (Ref. 2). Data was collected on the content, scope, and availability of the databases. In addition, subject index terms were assigned to databases selected for inclusion in the Directory.

The databases identified thus far have provided a starting point for the Directory. It is estimated that less than 40 percent of the DoD R&D databases were identified during the first survey. A follow-on effort is planned. In addition, the directories and vendor services utilized to identify databases will be monitored for new entries.

3. DATABASE DESIGN

3.1 User Requirements

To determine user needs for the Directory database, a dual-purpose questionnaire was designed. The questionnaire was used to determine data elements and user interface requirements for the database. Present and potential users of the DGIS were queried, and the results were tabulated and analyzed (Ref. 3). Both end-users and intermediaries were included in the survey. The users requested that the following data elements be searchable in the Directory:

- Database Name
- Acronym
- Update Frequency
- Beginning Date
- Size
- Database Producer Name
- Database Producer Contact
- Database Distributor Name
- Database Distributor Contact
- Database Generator Name
- Database Generator Contact
- Availability
- Descriptors
- Database Type
- System Software
- System Hardware
- Classification Restrictions
- Abstract
- Cost
- Gateway Identification and Availability
- Date Entry was Last Modified

The following capabilities were requested in the system:

- a. To define output formats.
- b. To download information.
- c. To choose menus or commands.
- d. To store search strategies.
- e. To store user defined formats.
- f. To have a common retrieval language.
- g. To require a minimum amount of keyboarding.
- h. To have a menu of predefined formats.
- i. To allow the user to reformat information.
- j. To explain user errors.
- k. To provide help screens.
- l. To allow the user to select the command language.
- m. To suggest related terms.
- n. To display the process followed to obtain the results.
- o. To allow for several levels of searching expertise.

Many of these capabilities address the issue of servicing a diverse user population made up of end-users and intermediaries. The majority of DTIC's current users are librarians or information specialists, but in the future it is expected that this complexion will change. It is anticipated that the end-user community (principally scientists, engineers, and managers) will be a growth area for DTIC and DGIS in the next 10 to 15 years. Given this fact, it is important to build capabilities such as menus, detailed error messages, and help screens. Providing for different levels of searching expertise has become very important.

3.2 Database Management System (DBMS)

The DGIS, of which the Directory is a fundamental part, runs on a VAX 11/780 minicomputer configuration with UNIX as the operating system and INGRES as the database management system. INGRES is a relational database management system originally developed by the University of California, Berkeley and now marketed by Relational Technology, Inc. The first question to be resolved was whether INGRES was suitable for the Directory or whether a second DBMS should be selected.

INGRES, it turned out, was an acceptable DBMS for the Directory. It provided features that satisfied many of the capabilities desired by the users. With INGRES, DGIS users will be able to search the Directory by using commands (for the experienced user) or menus (for the novice). Thus, the Directory will accommodate various levels of searching expertise.

The menus are clear, concise, and easy to read. Rules of consistency are applied throughout. In each menu, HELP is H, BACK UP is B and EXIT is E. Each menu has HELP screens associated with it which provide a more detailed explanation of the options. There are also HELP screens which describe each of the searchable and displayable fields. By using commands (native INGRES), the experienced user will be able to search on a wider variety of fields and to display database records in a wider variety of formats.

4. IMPLEMENTATION OF THE DIRECTORY

The Directory is now in a prototype phase. Menus have been developed and are being tested (Ref. 4). Figure 1 is the main menu which you will encounter when you log onto the DGIS (Ref. 5).


```

>>>>>>>>>>INFORMATION TRANSFER MODULES
1      directory      DGIS Directory of Online Resources.
2      communications  Connect to Information resources and people.
3      process        Information product tailoring.

>>>>>>>>>>INFORMATION UTILITIES
4      em            Electronic Mail.
5      files         File operations

>>>>>>>>>>SUPPORT INFORMATION
6      help          Description of features.
7      users         DGIS registered users.
8      info          DGIS news and information.
9      dtic/log      DGIS full text retrieval.

DGIS HOTLINE NUMBER:  (703) 276-8182

Enter a menu number, a command, "b" to back up, "t" for top or "e" to end:

```

If you wish to enter the Directory, enter menu number "1" or the command "DIRECTORY." A menu welcoming you to the DGIS Directory of Resources (figure 2) will be presented and will give you the option of using native INGRES or the menu-driven mode.

WHICH MODE WOULD YOU LIKE TO USE?

ENTER 1, 2, H OR E AND PRESS THE RETURN KEY.

5

To use native INGRES, select "1." To use the menu-driven system, select "2." If you elect to use the menu-driven system, the main menu (figure 3) gives you the option of searching the Directory, displaying a known database or search set, or connecting to a known database.

WHAT DO YOU WANT TO DO?

OPTION	DESCRIPTION
1	SEARCH DIRECTORY
2	DISPLAY RECORD(S)
3	CONNECT A DATABASE
H	HELP
E	EXIT DIRECTORY

ENTER 1, 2, 3, H OR E AND PRESS THE RETURN KEY.

Figure 3

At this point, you can solicit "HELP" or "EXIT" the Directory. The HELP screen associated with this menu (figure 4) defines the "SEARCH," "DISPLAY," and "CONNECT" operations.

WELCOME TO THE DOD GATEWAY INFORMATION SYSTEM (DGIS) DIRECTORY OF RESOURCES. YOU HAVE JUST SEEN THE MAIN MENU. FROM THE MAIN MENU YOU CAN DO THE FOLLOWING:

- 1 SEARCH DIRECTORY - SEARCHING THE DIRECTORY ALLOWS YOU TO FIND DATABASES BY NAME, BY DATABASE PRODUCER NAME, AND BY SUBJECT.
- 2 DISPLAY - DISPLAYING ALLOWS YOU TO SEE INFORMATION ABOUT ONE OR MORE DATABASES. USUALLY THE DISPLAY COMMAND FOLLOWS A SEARCH, BUT YOU CAN USE THE DISPLAY COMMAND DIRECTLY IF YOU KNOW THE DATABASE NAME.
- 3 CONNECT DATABASE - AFTER YOU COMPLETE THE SEARCH AND DISPLAY ONE OR MORE RECORDS, YOU MAY WANT TO ACCESS A DATABASE. THE CONNECT DATABASE COMMAND ALLOWS YOU TO ACCESS A DATABASE. YOU MUST KNOW THE DATABASE NAME OR ACRONYM TO USE THE CONNECT DATABASE COMMAND.

Figure 4

Enter the appropriate option number or letter and the corresponding menu will be displayed. Should you strike a key other than 1, 2, 3, H, or E, an error message will be displayed (figure 5) at the bottom of the main menu and you will be returned to the main menu.

WHAT DO YOU WANT TO DO?

OPTION	DESCRIPTION
1	SEARCH DIRECTORY
2	DISPLAY RECORD(S)
3	CONNECT A DATABASE
H	HELP
E	EXIT DIRECTORY

ENTER 1, 2, 3, H OR E AND PRESS THE RETURN KEY.

* * * ONLY 1, 2, H, AND E ARE VALID RESPONSES. PLEASE ENTER 1, 2, H OR E AND PRESS THE RETURN BUTTON. * * *

Figure 5

It is anticipated that the most frequently requested option will be the SEARCH option. By entering "1," the user will be directed to the SEARCH menu (figure 6). Although there are well over two dozen searchable data elements in each record, the majority of casual or novice users are expected to search by database name, database producer name, or subject.

WHAT WOULD YOU LIKE TO SEARCH?

OPTION	DESCRIPTION
1	DATABASE NAME
2	DATABASE PRODUCER
3	SUBJECT
H	HELP
E	EXIT DIRECTORY
B	BACK UP 1 SCREEN

ENTER 1, 2, 3, H, E OR B AND PRESS THE RETURN KEY.

Figure 6

This menu allows you to select one of the SEARCH options, "HELP," "EXIT," or "BACK UP." Should you elect to search by database name, the system will search the acronym field, as well as the database name field. By electing to search the database producer field, you will be queried for the complete name of the organization. Should you decide to search by subject, enter "3."

The SUBJECT SEARCH option allows you to enter a series of subjects linked with the Boolean operators AND, OR, NOT. The SEARCH menu gives you not only the HELP and EXIT options as in the main menu, but also the ability to BACK UP one screen. In a primitive fashion, this BACK UP option enables you to backtrack and trace the process which you followed, a desirable capability. As in the main menu, a HELP screen and error messages have been designed specifically for this menu.

The SUBJECT SEARCH option causes the user to be solicited for subjects (figure 7). If, for example, you are interested in identifying databases dealing with "HUMAN FACTORS," you should enter "HUMAN AND FACTORS." Although this is not a traditional menu with option numbers, you can still ask for HELP, EXIT the Directory, or BACK UP.

ENTER EACH SUBJECT TERM SEPARATED BY ONE OF THE
FOLLOWING: AND, OR, NOT. THEN PRESS THE RETURN
KEY.

(ENTER H FOR HELP, E FOR EXIT DIRECTORY, OR B FOR
BACK UP 1 SCREEN AND PRESS THE RETURN KEY.)

Figure 7

Figure 8 shows that the SUBJECT SEARCH request results in a search set with four database records. Each record represents a unique database.

HUMAN AND FACTORS
1/ 4 RECORDS

Figure 8

You will then be returned to the main menu (figure 3) where you may choose to search for another database, to display records from the previous search or the record for a known database, or to connect to a database. Should you elect to display records from the previous search, enter "2."

To display records, the system needs to know which records are to be displayed and in what format to display them. First, you are solicited for which records you would like to display (figure 9).

WHAT WOULD YOU LIKE TO DISPLAY?

OPTION	DESCRIPTION
1	KNOWN DATABASE RECORD
2	RECORD(S) FROM PREVIOUS SEARCH SET
H	HELP
E	EXIT DIRECTORY
B	BACK UP 1 SCREEN

ENTER 1, 2, H, E OR B AND PRESS THE RETURN KEY.

Figure 9

You have the option to display the record for a known database or records from the previous search. In addition, you can ask for HELP, EXIT the Directory, or BACK UP. At this point, you should enter "2" that you wish to see records from the previous search.

The format menu (figure 10) will appear so that you can select a display format for the records.

WHAT FORMAT WOULD YOU LIKE TO USE?

OPTION	DESCRIPTION
1	SHORT RECORD
2	SHORT RECORD WITH 1 LINE DESCRIPTION
3	SHORT RECORD WITH ABSTRACT
4	FULL RECORD
H	HELP
E	EXIT DIRECTORY
B	BACK UP 1 SCREEN

ENTER 1, 2, 3, 4, H, E OR B AND PRESS THE RETURN KEY.

Figure 10

Using the "SHORT RECORD" option, accession number, database name, and database producer name are displayed. With the "SHORT RECORD WITH 1 LINE DESCRIPTION" option, the accession number, database name, and first line from the abstract are displayed. The "SHORT RECORD WITH ABSTRACT" option results in a display of the accession number, database name, acronym, beginning data, database producer name, database type, abstract, and descriptors. The "FULL RECORD" option allows you to display all fields. Should you wish to see the accession number, database name, and database producer name, enter "1."

Now the system needs to know which records from the previous search set you wish to see (figure 11).

WHAT RECORDS WOULD YOU LIKE TO SEE?

OPTION	DESCRIPTION
1	ALL RECORDS
2	FIRST TEN RECORDS
3	SELECTED RECORD(S)
H	HELP
E	EXIT DIRECTORY
B	BACK UP 1 SCREEN

ENTER 1, 2, 3, H, E OR B AND PRESS THE RETURN KEY.

Figure 11

You can display all records, the first ten records (or fewer if there are less than ten records in the search set), or a selected record(s). There are only four records in the search set example, so enter "1" to display them all.

1/	ACCESSION NUMBER:	55
	DATABASE NAME:	DoD Human Factors Engineering Data Bank System
	DATABASE PRODUCER:	Army Human Engineering Laboratory
2/	ACCESSION NUMBER:	106
	DATABASE NAME:	Human Resources Management Information System
	DATABASE PRODUCER:	Air Force Human Resources Laboratory

Figure 12

The records will be displayed screen after screen until the last record is displayed (figure 12). Then you will be sent back to the main menu (figure 3). If you have access to any of the databases which you identified through the Directory, you may want to CONNECT (i.e., dial in) to them. If you do not have access to these databases, you may want to display the entire record for any or all of the databases which you retrieved in your search. In this way you can identify a person to contact in order to gain access to the database(s). At this point, you also have the option of leaving the Directory. By entering "E" for EXIT, you will revert to the DGIS main menu (figure 1) where you can select from a number of options.

Menus used with the Directory are easy to use and require little explanation. The questions asked by the system and acceptable responses by the user are quite clear. HELP or BACK UP options are available when the user becomes confused. The menus are suitable for a novice or occasional user. As the user accesses the Directory more frequently, the choices to enter the Directory using native INGRES may be desirable.

5. FUTURE DIRECTIONS

The Directory of Resources is at prototype stage. It is being tested by a select group of users within DoD for 6 months. Based on their recommendations, the system will be modified to enhance performance. At the conclusion of the test period, the Directory will become operational, and the number of users will be expanded.

Development of the Directory must now move in the direction of a natural language interface, which is the optimal interface identified by the user community. Unfortunately, technology to implement such an interface in this version of the Directory is not available. It is hoped that new developments in the field of artificial intelligence will provide the needed technology within the next 5-10 years.

6. CONCLUSIONS

The utility of the Directory will be depend on its ease of use, comprehensive coverage, and ability to deliver results. Guidelines followed in developing the Directory emphasize those characteristics. Menus were designed to guide users through the Directory to the information they need, and command mode was made available for the convenience of frequent users. A solid core of databases was carefully selected to form the foundation of the Directory. The Directory was designed to accommodate expanded coverage and variation in data collection methods. These features combine to deliver relevant results to the user. As the scope of the Directory expands, it will provide DoD's scientific and technical information community with a powerful, responsive information tool.

7. ACKNOWLEDGEMENTS

The DGIS is a joint effort with the Office of the Secretary of Defense, Washington Headquarters Services, Directorate of Computer and Office Automation Resources. Project support for the Directory was provided by the Department of Army, Office of the Deputy Chief of Staff for Research, Development and Acquisition, and the U.S. Army Materiel Command.

8. REFERENCES

1. Cotter, G. A. The DoD Gateway Information System. October 1985, AD-A161-701, National Technical Information Service, Springfield, VA.
2. Jacobson, C. E.; Cohen, R. S.; and Michel, J. T. Directory of DoD-Sponsored R&D Data Bases. AD-B085-600, September 1984, Defense Technical Information Center, Alexandria, VA.
3. Chastain, G. C. A Study of User-Defined Searching Requirements for the On-Line Version of the Directory of DoD-Sponsored R&D Data Bases on the Defense Gateway Computer System. AD-A153-000, March 1985, National Technical Information Service, Springfield, VA.
4. Jacobson, C. E. The Functional Specification for the Directory of Resources on the DoD Gateway Information System. January 1986, Defense Technical Information Center, Alexandria, VA.
5. Kuhn, A. D. and Cotter, G. A. The DoD Gateway Information System (DGIS): User Interface Design. March 1986,
6. Cotter, G.A. The DoD Gateway Information System: Prototype Experience. AD-A166-200, April 1986, National Technical Information Service, Springfield, VA.